

1/10/17

HW: "Inverses of Functions" HW section

Test 3 on Tuesday 1/17

AIM: How do we find Inverses of Functions?

Warm Up:

1) GIVEN $f(x) = 2x + 9$ and $g(x) = \frac{x-9}{2}$. EVALUATE $f(g(2)) = 2$

$$g(2) = \frac{2-9}{2} = -\frac{7}{2}$$

$$f\left(-\frac{7}{2}\right) = 2\left(-\frac{7}{2}\right) + 9 = -7 + 9 = 2$$

Exercise #1: Consider the two linear functions given by the formulas $f(x) = \frac{3x+7}{2}$ and $g(x) = \frac{2x-7}{3}$.

(a) Calculate $f(5)$ and $g(11)$.

$$f(g(11)) = 11$$

$$f(5) = \frac{3(5)+7}{2} = \frac{22}{2} = 11$$

$$g(11) = \frac{2(11)-7}{3} = \frac{15}{3} = 5$$

(b) Calculate $f(0)$ and $g\left(\frac{7}{2}\right)$.

$$f(0) = \frac{3(0)+7}{2} = \frac{7}{2}$$

$$g\left(\frac{7}{2}\right) = \frac{2\left(\frac{7}{2}\right)-7}{3} = \frac{0}{3} = 0$$

(c) Calculate $f(g(-1)) = -1$

$$g(-1) = \frac{2(-1)-7}{3} = \frac{-9}{3} = -3$$

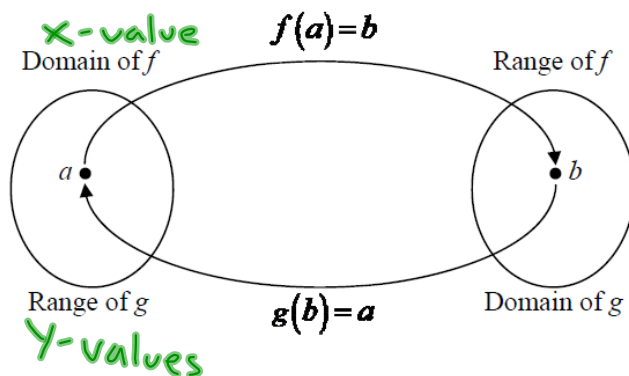
$$f(-3) = \frac{3(-3)+7}{2} = \frac{-2}{2} = -1$$

(d) Without calculation, determine the value of $f(g(\pi))$.

$$= \pi$$

The two functions seen in Exercise #1 are inverses because they literally “undo” one another. The general idea of inverses, $f(x)$ and $g(x)$, is shown below in the mapping diagram.

* The inverse switches the x and y values



Exercise #2: If the point $(-3, 5)$ lies on the graph of $y = f(x)$, then which of the following points must lie on the graph of its inverse? (y, x)

(1) $(3, -5)$

(3) $(5, -3)$

(2) $(-5, 3)$

(4) $\left(-\frac{1}{3}, \frac{1}{5}\right)$

Inverse functions have their own special notation. It is shown in the box below.

INVERSE FUNCTION NOTATION

If a function $y = f(x)$ has an inverse that is also a function we represent it as $y = f^{-1}(x)$.

$g(x) \xrightarrow{\text{inverse}} g^{-1}(x)$

Exercise #3: The linear function $f(x) = \frac{2}{3}x - 2$ is shown graphed below. Use its graph to answer the following questions.

(a) Evaluate $f^{-1}(2)$ and $f^{-1}(-4)$.

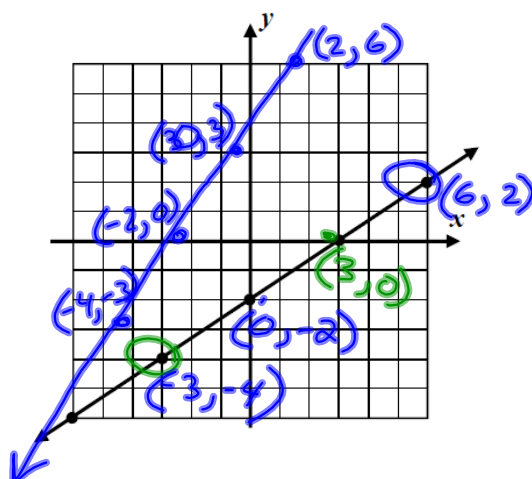
$f^{-1}(2) = 6$

$f^{-1}(-4) = -3$

(b) Determine the y-intercept of $f^{-1}(x)$.

(The x-intercept of $f(x)$)
 $(0, 3)$

(c) On the same set of axes, draw a graph of $y = f^{-1}(x)$.

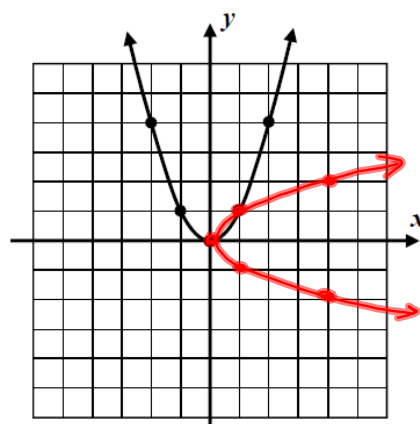


Exercise #4: A table of values for the simple quadratic function $f(x) = x^2$ is given below along with its graph.

x	-2	-1	0	1	2
$f(x)$	4	1	0	1	4

(a) Graph the inverse by switching the ordered pairs.

x	4	1	0	1	4
$f^{-1}(x)$	-2	-1	0	1	2



(b) What do you notice about the graph of this function's inverse?

It is Not
a function!

EXISTENCE OF INVERSE FUNCTIONS

A function will have an inverse that is also a function if and only if it is one-to-one. Hence, a quick way to know if a function has an inverse that is also a function is to apply the Horizontal Line Test.